

**RETROFIT SISTEM KONTROL DAN INTEGRASI SAFETY DEVICE
PADA AUXILIARY ENGINE KAPAL TRITON ARJUNA DENGAN
PENDEKATAN RELIABILITY ENGINEERING**

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ABSTRAK

Keandalan mesin bantu (*Auxiliary Engine*) merupakan faktor krusial dalam menjamin kelangsungan operasional dan keselamatan di atas kapal. Kapal Triton Arjuna menghadapi tantangan berupa sistem kontrol konvensional pada mesin bantu yang sudah usang, di mana perangkat pengaman (*safety device*) bawaan sering kali tidak akurat, sehingga meningkatkan risiko kerusakan fatal dan *blackout*. Laporan praktik keinsinyuran ini membahas mengenai proses retrofit sistem kontrol menggunakan modul digital ComAp IntelliGen 9AMF. Pendekatan yang digunakan adalah *Reliability Engineering* untuk memodernisasi sistem proteksi melalui pemantauan parameter suhu dan tekanan secara real-time dan terintegrasi. Tahapan praktik keinsinyuran meliputi studi literatur, identifikasi kegagalan sistem lama, perancangan skema kontrol, hingga tahap implementasi teknis dan validasi. Hasil implementasi menunjukkan peningkatan presisi proteksi dengan penetapan *setpoint* kritis pada tekanan oli rendah sebesar 1,5 Bar dan suhu air pendingin tinggi sebesar 95°C. Validasi melalui pengujian fungsi (*Function Test*) membuktikan bahwa sistem mampu memberikan respon shutdown otomatis yang responsif dan akurat sebelum mesin mencapai kondisi kegagalan fatal. Kesimpulannya, penerapan teknologi digital ini memberikan perlindungan berlapis melalui fitur *pre-alarm* dan data *logging*, yang secara signifikan meningkatkan keandalan operasional mesin diesel tanpa memerlukan penggantian unit mesin secara keseluruhan..

Kata kunci: Retrofit, *Auxiliary Engine*, IntelliGen 9AMF, *Reliability Engineering*, *Safety Device*.

**RETROFIT OF THE CONTROL SYSTEM AND INTEGRATION
OF SAFETY DEVICES ON THE AUXILIARY ENGINE OF THE
TRITON ARJUNA SHIP WITH A RELIABILITY ENGINEERING
APPROACH**

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ABSTRACT

The reliability of the Auxiliary Engine (AE) is a crucial factor in ensuring operational continuity and safety on board. The Triton Arjuna vessel faces challenges due to obsolete conventional control systems, where original safety devices are often inaccurate, increasing the risk of fatal damage and total blackout. This engineering practice report discusses the retrofit process of the control system using the ComAp IntelliGen 9AMF digital module. The approach utilized is Reliability Engineering to modernize the protection system through integrated real-time monitoring of temperature and pressure parameters. The engineering practice stages include literature study, identification of old system failures, control scheme design, through to technical implementation and validation. The implementation results show an increase in protection precision with critical setpoints established at 1.5 Bar for Low Oil Pressure and 95°C for High Water Temperature. Validation through functional testing proves that the system provides a responsive and accurate automatic shutdown response before the engine reaches fatal failure conditions. In conclusion, the application of this digital technology provides multi-layered protection through pre-alarm features and data logging, significantly enhancing the operational reliability of diesel engines without requiring a total engine unit replacement.

Keywords: *Retrofit, Auxiliary Engine, IntelliGen 9AMF, Reliability Engineering, Safety Device.*